

Docket No. F-6690

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REMARKS

Claims 1-6 remain in this application, Claims 2, 5 and 6 have been withdrawn.

Claims 1, 3 and 4 have been amended to limit the claimed product to "an unbonded maraging steel plate with a thickness of less than 0.5 mm." In this description, the term "unbonded" is supported throughout most of the specification, which describes the formation of maraging steel plates without mentioning that they are bonded to anything else and particularly on page 24, lines 2-16 and the paragraph bridging pages 31 and 32 which describe the fabrication of the 0.3 mm thick unbonded plates tested for composition and properties as shown in Tables 1-3 and 11-13, and Figures 1-10. The "less than 0.5 mm." thickness of the maraging steel plates recited in the amended claims is also supported by the description of the preparation of the 0.3 mm thick plates utilized in developing the data of the tables and figures of the specification as cited above, and also more specifically, on page 14, lines 22-25 and page 19, lines 1-5.

Claim 1 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Floreen et al. (US 3,532,491), who teach the production of heavy sections of maraging steel having a thickness of at least one half inch (col. 3, line 10 and claim 1), which is 25.4 times the maximum thickness of 0.5 mm of the maraging steel

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plates now recited in the applicants' claims. Floreen et al. show that when maraging steel containing percentages of certain elements within specifically defined ranges is substituted for maraging steels with more conventional amounts of these elements, particularly cobalt, heavy sections 5/8 inch thick having various improved mechanical properties, namely yield strength, elongation, and impact energy, may be obtained. These improvements are ascribed by Floreen et al. to their improved maraging steel composition resulting in reduced segregation effects, such effects being presumably caused by the early stages or onset of austenite reversion as shown by the formation of dark bands and possibly internal laminations (col. 2, lines 32-39).

It is submitted, however, that the foregoing Floreen et al disclosure involving relatively thick (at least 1/2 inch), heavy sections of maraging steel does not render obvious to a person having ordinary skill in the art the product now covered by applicants' claims as presently amended. Such product is a relatively thin maraging steel plate, i.e. less than 0.5 mm thick, or no more than 1/25 of the minimum of 1/2 inch of the heavy sections disclosed by Floreen et al. Applicants' claimed product also contains elements within the ranges recited in applicants' claims, and has Ti component and Mo component segregation ratios of 1.3 or less each, and/or a nonmetallic inclusion of 30 micrometers or less, and unexpectedly

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high fatigue strength, as shown in Tables 12 and 13 on pages 34 and 35 of the specification and Figure 10 of the drawings.

With regard to the question of unobviousness, Floreen et al. disclose in col. 5, lines 15-35 and col. 6, lines 1-3 descriptions of the banding characteristics obtained by etching two 3 inch thick maraging steel billets, the first shown in Figure 1 wherein the billet is made of a prior art maraging steel (18-Ni-250 grade) outside the scope of the invention and the other, Figure 2, wherein the billet is made of a maraging steel within the invention. Figure 1 shows a pronounced pattern of bands indicating a marked segregation effect, while Figure 2 shows that the banding pattern of the billet under the invention is much less pronounced; some banding is nevertheless clearly visible indicating the presence of some segregation effects. In this connection, it is well known that segregation effects become much more significant as the thickness of a maraging steel structure is reduced. In the case of Figure 2 of Floreen et al., one skilled in the art would conclude that if the 3 inch billet of the reference were reduced to 0.5 mm., the maximum claimed by applicants, which is about 1/150 of the thickness of the sample disclosed in the reference, the relatively faint banding pattern shown in Figure 2 would become much more significant. Thus, such skilled person would not be led by such disclosure to apply the disclosed inventions to maraging steel plates substantially thinner than the heavy sections taught by the reference, and to predict that such thin

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plates would have superior fatigue strength, as shown in applicants' Tables 12 and 13.

Finally, in connection with the question of unobviousness, it is noted that Floreen et al. state that despite the virtues of prior art maraging steels, "a persistent and vexatious problem evolved, particularly in the production of heavy sections, e.g. forgings" which was "the propensity for the steels to develop segregation characteristics ..." (col. 1, lines 42-46) and, following a discussion of banding and internal lamination formation, that "such metallurgical behavior, unless obviated, would continue to be a drawback in heavy section applications..." (col. 1, lines 56-58). It is believed that these statements decrease rather than increase the likelihood that a person skilled in the art would be led by the Floreen et al. disclosure to produce a thin plate of maraging steel with a thickness of less than 0.5 mm with the expectation that it will have superior fatigue strength, as is the case with applicants' claimed product.

For the foregoing reasons, it is submitted that the rejection on Floreen et al. is not well taken and should be withdrawn.

Claim 3 has been rejected under 35 U.S.C. 103(a) as being unpatentable over JP 49-009465 A (JP'465), which discloses a mirror surface mold prepared by bonding a corrosion resistant material such as stainless steel with maraging steel containing percentages of Ni, Co, Mo, Ti, Al, O and Fe overlapping the

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percentages of those elements in the steel covered in claim 3 of the present application, the maraging steel containing defects including nonmetallic inclusions less than 2 micrometers. It should be noted first that claim 3 as amended is limited to an unbonded maraging steel plate having a thickness of less than 0.5 mm, neither feature of which is disclosed or suggested by the reference. Furthermore, the statement that pinholes and nonmetallic inclusions are decreased in size to under 2 mm by graphite deoxidation has the obvious purpose of preventing significant defects from being transferred to the material being molded rather than to improve mechanical properties such as fatigue strength. Thus, since there is nothing in the disclosure of JP '465 to suggest an unbonded maraging steel plate having a thickness of less than 0.5 mm, as recited in claim 3 or that such plate would have superior fatigue strength as shown in applicants' Tables 12 and 13, the rejection is not well supported and should be withdrawn.

Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over JP '465 in view of Floreen et al. on the ground that it would be obvious to one having ordinary skill in the art to perform the process of JP '465 to control the inclusion defects to 2 micrometers, on the maraging steel of Floreen et al. which is stated to be "substantially devoid of detrimental segregation effects." It should be noted first in reply to this position that in view of the difference between the products recited in claims 1 and 3 as amended from those disclosed by Floreen et

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al. and JP '465 respectively, as discussed previously, there is no way that the teachings of these two references could be combined by a person skilled in the art so as to render obvious the product of applicants' claim 4.

Furthermore, and aside from the differences between the subject matter of the claims and the teachings of the references, there is nothing in the disclosures of the references which would lead the skilled person to combine their teachings as stated in the rejection. Thus, the process described by JP '465 is not for the purpose of producing a maraging steel of good mechanical properties as in Floreen et al. but rather to produce a mirror-surface mold having only small imperfections, of 2 micrometers or less. Moreover, such mirror-surface mold is not made solely of maraging steel as is the product of Floreen et al. but of maraging steel bonded with stainless steel so that the strength of the mold is not dependent on the maraging steel alone. Therefore, since both the purpose of JP '465 of obtaining imperfections such as nonmetallic inclusions of 2 micrometers or less, is absent in Floreen et al. and Floreen et al. show no interest in making the mirror surface mold of JP '465 composed of maraging steel bonded to stainless steel, one having ordinary skill in the art would not be led to perform the process taught by JP '465 on the maraging steel taught by Floreen et al., for the reasons stated in the Office Action. In view of these distinctions, this rejection should also be withdrawn.

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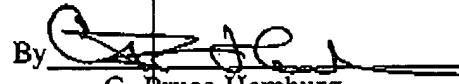
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Applicant respectfully requests a one month extension of time for responding to the Office Action. Please charge the fee of \$110.00 for the extension of time to Deposit Account No. 10-1250.

This application is now thought to be in condition for allowance, and such action at an early date is earnestly solicited.

Respectfully submitted,

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